



PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Pipe Line Plugger

We, E. PASS & COMPANY LIMITED, a British Company, of Station Road, Denton, in the County of Lancaster, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention concerns pipe line pluggers.

It is sometimes necessary to seal off a section of fluid-carrying pipe-line, for instance when repairs are necessary, and the object of the present invention is to provide, for use at such times, improved apparatus for plugging a pipe line at a given location.

According to the present invention pipe line plugging apparatus comprises a pipe-embracing assembly adapted to support under-pressure drilling equipment whilst the equipment is used to drill two holes through a pipe wall at oppositely disposed locations therein and within the pipe-embracing assembly, the pipe-embracing assembly including a valve which is opened to allow the drill of the drilling equipment to pass through to the pipe, the apparatus further comprising a plug assembly including a double acting hydraulic cylinder with a ram and an expansible sealing plug carried by the ram, the plug assembly being adapted for attachment to the pipe embracing assembly and being operable in such a manner that by actuation of the ram in one direction, the plug can be moved to lie transversely of the pipe and extending through both of two holes at oppositely disposed locations in the pipe and can thereafter be expanded to plug the pipe, and that by actuation of the ram in the other direction, the plug can be withdrawn from the pipe.

Preferably, when the plug is in sealing position within the pipe there is a by-pass flow-way through the plug, the valve of the pipe-embracing assembly (when open), and an outlet on the hydraulic assembly (which may be also fitted with a valve).

[Price 4s. 6d.]

An embodiment of the invention will now be described by way of example with reference to the accompanying drawings in which:—

Fig. 1 is a cross section through a pipe which is to be plugged and through a pipe-embracing assembly on the pipe and showing a cutter being used for cutting a hole in the pipe; and

Fig. 2 is a longitudinal section through the pipe of Fig. 1 and the pipe-embracing assembly thereon and showing a plug being inserted in the pipe.

Referring to the drawings and particularly Fig. 2 thereof, the present pipe line plugger comprises two main assemblies, a pipe embracing assembly indicated generally at 10 in the drawings and an hydraulic assembly indicated generally at 11 in the drawings.

The pipe-embracing assembly 10 comprises a split tee, the two halves 12 and 13 of which are adapted to be secured in sealing contact around the pipe to be plugged, and a valve 14 controlled by a handle 15. The lower half 13 of the tee has a portion 16 which fits around the lower half of the pipe 17 to be plugged, and centrally disposed thereof a downwardly extending short cylindrical extension 18 having a lower end 19. The upper half 12 of the tee is of generally similar construction, that is to say, it has a portion 22 which fits around the corresponding upper half of the pipe 17, and, centrally disposed thereof, an upwardly extending cylindrical portion 23. However, this cylindrical portion 23, which is in line with the cylindrical portion 18 of the lower half when the two halves are secured together and to the pipe as by welding in sealing relationship with the pipe, is somewhat longer than the portion 18 and terminates with a flange 24 to which is detachably secured the valve 14, which latter is of any suitable type capable of arresting the flow of fluid from the pipe in operation, as is later described. The valve 14 is also designed so that under-pressure drilling equipment of known type may be secured

thereto, and, with the valve open, may be used to drill a hole through the pipe walls at oppositely disposed locations, the drill means being accommodated during this operation by the cylindrical portions 18 and 23 of the tee 10.

The hydraulic assembly 11 comprises a housing 25, a valve controlled double acting hydraulic cylinder 26 and associated ram 27, and an expansible plug 28 on the end of the ram. The housing 25 is generally cylindrical and has a flange 29 similar to that of flange 24 of the tee by means of which it may be secured to the valve 14, the latter then being sandwiched between the flanges 24 and 29 of the tee and the housing. The housing 25 is hollow, thus providing a cylindrical passage-way when the valve 14 is open, in conjunction with the cylindrical portions 18 and 23 of the tee through which the ram 27 may extend, as will shortly be described. There is a side opening 32 fitted with a valve 33, near the upper end of the housing 25. The upper end of the housing 25 is also designed to have mounted thereon the double acting hydraulic cylinder 26, the upper end of the ram 27 constituting a piston therein. The lower end of the ram 27 carries the expansible plug 28 as has already been said. This plug consists basically of a hollow open ended cylinder 34. It has two small peripheral flanges 35 and 36, one near end end, between which is mounted a cylindrical rubber facing 37. Within the plug are welded six wedge members 38. These wedges are equispaced around the inner periphery of the cylinder 34, extending radially inwards thereof, and having inclined inner edges 39 which co-operate with a conical expander member 42 carried by the end of the ram 27. The edges 39 are each divided into two portions by a central recess 43 to provide a better sliding contact between the edges and the plug expander member 42. The plug cylinder 34 is attached to the expander 42 by a large washer 44 held against the larger ends of the wedges 38 by a bolt 45 engaging in a screwthreaded hole 46 in the smaller lower end of the expander 42. The plug cylinder 34 is longitudinally slit as at 47 to allow expansion thereof and also to form a flow passage.

In use, when it is wished to plug say a water pipe line, the following procedure is adopted:

First the tee 10 is welded in place around the pipe 17. Then the valve 14 is secured in place, the underpressure drilling equipment indicated generally at 40 in Fig. 1 is mounted in position on the valve 14 and with the valve 14 open the pipe 17 is drilled through as previously described with a cutter 48 to form upper and lower holes 49 and 50 therein, having diameters slightly larger than the internal diameter of the pipe. The cutter 48 is then retracted, the drilling equipment 40 is removed and the valve 14 is closed. The housing 25 is fitted to the hydraulic cylinder 26 and the

plug 28 being assembled on the ram 27, the unit thus formed is secured to the valve 14. The valve is then opened and the hydraulic fluid is supplied to the cylinder 26 so as to force the ram 27 downwards. The plug 28 passes into the pipe 17 through the upper hole 49 and the bottom part of the plug passes out through the lower hole 50. An abutment constituted by a flange 51 within the lower cylindrical portion 18 of the tee engages the lower edge of the cylinder 34 and locates the plug 28 in the required position, the rubber faced part 37 of the cylinder 34 extending both above and below the pipe. The ram 27, however, continues its downward movement which by the action of the expander 42 and wedges 38 cause the cylinder 34 of the plug to increase in size diametrically and the rubber faced portion to come into sealing engagement with the holes in the pipe. Expansion of the cylinder 34 is allowed by virtue of the longitudinal slit 47 therein. The flow of water along the pipe is thus arrested, except that the slit 47 in the plug cylinder 34 (which is arranged to face the water flow in the pipe), the open valve 14, and the side opening 32 in the housing (if the valve 33 controlling it is also open), enables water to be by-passed around the length of pipe to be repaired. Of course if such by-passing is not required the valve 33 on the side opening is closed. The expander member 42 can be locked in the cylinder 34 by means of the spindle 60 accessible from outside the lower end 19 of the cylindrical extension 18 of the lower half 13 of the tee 10 and rotatably mounted in the extension 18 but sealed thereto. A ridged portion 61 on the end of the spindle 60 engages in a slot 62 in the bolt 45 and on rotation turns the bolt to tighten the washer 44 against the members 38 thereby locking the member 42 within the cylinder 34 and ensuring that a good seal is maintained.

WHAT WE CLAIM IS:—

1. Pipe line plugging apparatus comprising a pipe-embracing assembly adapted to support under-pressure drilling equipment whilst the equipment is used to drill two holes through a pipe wall at oppositely disposed locations therein and within the pipe-embracing assembly, the pipe-embracing assembly including a valve which is opened to allow the drill of the drilling equipment to pass through to the pipe, the apparatus further comprising a plug assembly including a double acting hydraulic cylinder with a ram and an expansible sealing plug carried by the ram, the plug assembly being adapted for attachment to the pipe embracing assembly and being operable in such a manner that by actuation of the ram in one direction, the plug can be moved to lie transversely of the pipe and extending through both of two holes at oppositely disposed locations in the pipe and can thereafter be expanded to plug the pipe and that by actuation of the

ram in the other direction, the plug can be withdrawn from the pipe.

2. Apparatus according to claim 1, wherein the sealing plug is arranged to abut against a part of the pipe embracing assembly after the plug has been introduced through two holes at oppositely disposed locations in the pipe wall and further actuation of the ram in the said one direction thereafter causes expansion of the plug.

3. Apparatus according to claim 2, wherein the plug comprises an expansible cylinder, a resilient covering carried on the cylinder for sealing contact with the peripheries of the holes in the pipe wall and with the pipe wall, a generally conical expander member carried on the end of the hydraulic ram and located within the expansible cylinder, the interior of the expansible cylinder having wedge-shaped parts for co-operation with the expander member whereby when the expansible cylinder is held stationary and the expander member is forced into it by the ram, the expander member will be pushed between the wedge-shaped parts and will expand the cylinder.

4. Apparatus according to claim 3, wherein a by-pass flow-way for fluid in the pipe line is provided through the plug, through the valve of the pipe-embracing assembly and through an outlet on the plug assembly.

5. Apparatus according to claim 4, wherein the by-pass flow-way through the plug lies

through slits in the expansible cylinder and its resilient covering, the slit in the expansible cylinder allowing expansion of the cylinder.

6. A method of plugging a pipe line comprising the steps of securing on the pipe a pipe-embracing assembly, securing under-pressure drilling equipment on the pipe-embracing assembly, opening a valve in the pipe-embracing assembly, introducing the drill of the drilling equipment to the pipe through the valve, drilling two holes in the pipe wall at oppositely disposed locations therein and within the pipe embracing assembly, retracting the drill, closing the valve, removing the drilling equipment, securing on the pipe-embracing assembly a plug assembly including an expansible sealing plug carried by a double-acting hydraulic ram, opening the valve of the pipe-embracing assembly, actuating the hydraulic ram to insert the plug through the valve and into the two holes in the pipe and thereafter expanding the plug.

7. Pipe-line plugging apparatus substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

8. A method of plugging a pipe-line substantially as hereinbefore described.

For the Applicants.

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